

Application No.: 10/732,724  
Art Unit 3752

Patent Application  
Attorney Docket No. D/A3149

### **AMENDMENTS TO THE SPECIFICATION**

A. At page 5, lines 24-28 delete the pending text and replace therewith as follows:

-- As shown, the micromechanical dispensing mechanisms 210, 212 possess inlets 213, 214 for receiving a fluid to be dispensed. The inlets 213, 214 are fluidly connected to channels 254, 255 that conduct fluid from the fluid reservoirs 220, 222 to the micromechanical dispensing mechanisms 210, 212. The fluid reservoirs 220, 222 are removably fluidly coupled to channel ports 226, 228 by means of the reservoir ports 223, 225 of fluid reservoirs 220, 222. -- .

B. At page 8, lines 4-21 delete the pending text and replace therewith as follows:

-- Additionally depicted in FIG. 2 is an optional orifice plate 295, further comprising an orifice 296. The optional orifice plate 295 is arranged such that fluid 271, 273 dispensed by at least one of the micromechanical dispensing mechanism 210, 212 is further dispensed through the orifice 296 , which dispensing of the fluid 271, 273 through the orifice 296 is depicted in FIG. 2 by reference numbers 271a, 273a.

In one embodiment, the optional orifice plate 295 is similar or identical to the orifice plate containing an orifice as depicted in FIG. 1 and described from col. 3, l. 57 to col. 4, l. 54 of U.S. Patent No. 6,378,780 to Edward J. Martens III et al., which patent is incorporated by reference herein, and which patent is hereinafter referred to as the "Martens patent" or simply as "Martens."

Referring still to FIG. 2, several embodiments of the micromechanical dispensing mechanisms 210, 212 are now described in accordance with the current invention.

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In one embodiment, one or more of the micromechanical dispensing mechanisms 210, 212 comprises electrostatically-driven membranes, which electrostatically-driven membranes are depicted in FIG. 2 by reference number 210a. In one embodiment, for example, one or more of the present micromechanical dispensing mechanisms 210, 212 comprises a membrane that is similar or identical to the electrostatically-actuated diaphragm 10 of the fluid ejector 100 as described and depicted in the foregoing U.S. Patent No. 6,357,865 to Joel A. Kubby et al., which patent is incorporated herein by reference, and which patent is hereinafter referred to as the "Kubby patent" or simply "Kubby". -- .

C. At page 9, lines 9-15 delete the pending text and replace therewith as follows:

-- Referring again to the present FIG. 2, in a further embodiment, one or more of the micromechanical dispensing mechanisms 210, 212 comprises an electrostatically-actuated piston, which electrostatically-actuated piston is depicted in FIG. 2 by reference number 210b. In one embodiment, for example, one or more of the present micromechanical dispensing mechanisms 210, 212 comprises a piston that is similar or identical to the electrostatically-actuated piston 110 of the fluid ejector 100 as described in the foregoing U.S. Patent No. 6,367,915 to Arthur M. Gooray et al., which patent is incorporated by reference herein, and which patent is hereinafter referred to as the "Gooray '915 patent." -- .

D. At page 9, lines 32-34 delete the pending text and replace therewith as follows:

-- Again referring to the present FIG. 2, in another embodiment, one or more of the micromechanical dispensing mechanisms 210, 212 comprises magnetically-actuated membranes, which magnetically-actuated membranes are depicted in FIG. 2 by reference number 210c. -- .

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E. At page 10, lines 30-32 delete the pending text and replace therewith as follows:

-- Referring again to the present FIG. 2, in another embodiment, one or more of the micromechanical dispensing mechanisms 210, 212 comprises a ballistic aerosol micromechanical dispensing mechanism , which ballistic aerosol micromechanical dispensing mechanism is depicted in FIG. 2 by reference number 210d . -- .

F. At page 11, lines 27-29 delete the pending text and replace therewith as follows:

-- Again referring to the present FIG. 2, in another embodiment, one or more of the micromechanical dispensing mechanisms 210, 212 comprises an arrangement incorporating a thermally-actuated paddle vane , which thermally-actuated paddle vane is depicted in FIG. 2 by reference number 210e . -- .

G. From page 15, line 33 to page 16, line 5 delete the pending text and replace therewith as follows:

-- The micromechanical dispensing mechanisms 410, 411, 412 possess inlets 413, 414, 415 for receiving a fluid to be dispensed. The inlets 413, 414, 415 are fluidly connected to channels 454, 455, 456 that conduct fluid from fluid reservoirs 420, 421, 422 to micromechanical dispensing mechanisms 410, 411, 412. The fluid reservoirs 420, 421, 422 are removably fluidly coupled to channel ports 426, 427, 428 by means of the reservoir port coupling mechanisms 423, 424, 425 of the fluid reservoirs 420, 421, 422. One skilled in the art is familiar with a variety of means to construct a removable fluid reservoir. -- .

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H. From page 16, line 30 to page 17, line 16 delete the pending text and replace therewith as follows:

-- In one embodiment of the micromechanical dispensing device 400, one or more of the micromechanical dispensing mechanisms 410, 411, 412, comprises an electrostatically-driven membrane , which electrostatically-driven membrane is depicted in FIG. 4 by reference numbers 410a, 411a and which is substantially similar, or identical to the electrostatically-driven membrane described in the foregoing Kubby patent as described in connection with FIG. 2 hereinabove.

In another embodiment of the micromechanical dispensing device 400, one or more of the micromechanical dispensing mechanisms 410, 411, 412, comprises an electrostatically-actuated piston , which electrostatically-actuated piston is depicted in FIG. 4 by reference numbers 410b, 411b and which is substantially similar, or identical to the electrostatically-actuated piston described in the foregoing Gooray '915 patent as described in connection with FIG. 2 hereinabove.

In a further embodiment of the micromechanical dispensing device 400, one or more of the micromechanical dispensing mechanisms 410, 411, 412, comprises a magnetically-actuated membrane , which magnetically-actuated membrane is depicted in FIG. 4 by reference numbers 410c, 411c and which is substantially similar, or identical to the magnetically-actuated membrane described in the foregoing Genovese patent as described in connection with FIG. 2 hereinabove.

In a further embodiment of the micromechanical dispensing device 400, one or more of the micromechanical dispensing mechanisms 410, 411, 412, comprises a thermally-actuated paddle vane , which thermally-actuated paddle vane is depicted in FIG. 4 by reference numbers 410e, 411e and which is substantially similar, or identical to the thermally-actuated paddle-vane described in the foregoing Silverbrook patent as described in connection with FIG. 2 hereinabove.

In yet a further embodiment one of the micromechanical dispensing device 400, or more of the micromechanical dispensing mechanisms 410, 411, 412, comprises a ballistic aerosol dispensing mechanism , which ballistic aerosol dispensing

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mechanism is depicted in FIG. 4 by reference numbers 410d, 411d and which is substantially similar, or identical to the ballistic aerosol dispensing mechanism described in the foregoing Peeters '718 patent as described in connection with FIG. 2 hereinabove. -- .

I. From page 18, line 32 to page 19, line 2 delete the pending text and replace therewith as follows:

-- Additionally depicted in FIG. 4 is an optional orifice plate 495, further comprising an orifice 496. The optional orifice plate 495 is arranged such that fluid 471, 472, 473 dispensed by at least one of the micromechanical dispensing mechanisms 410, 411, 412 is further dispensed through the orifice 496 , which dispensing of the fluid 471, 472, 473 through the orifice 496 is depicted in FIG. 4 by reference numbers 471a, 472a, 473a. -- .

J. From page 21, line 28 to page 22, line 2 delete the pending text and replace therewith as follows:

-- The micromechanical dispensing mechanism 610 possess an inlet 613 for receiving fluids to be dispensed by means of channel 611-611'. The channel 611-611' is fluidly connected to the exit of valve 665. The valve 665 selectively couples fluid reservoirs 620, 621, 622 to dispensing mechanism 610 as described in more detail below. The channel 612 conducts fluid from fluid reservoirs 620, 621, 622 to the entrance of valve 665. The channel 612 is fluidly connected to channel ports 626, 627, 628. The channel ports 626, 627, 628 provide removable fluid coupling to the fluid reservoirs 620, 621, 622 by means of reservoir ports 623, 624, 625 of the fluid reservoirs 620, 621, 622. -- .

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K. At page 23, lines 4-23 delete the pending text and replace therewith as follows:

-- In one embodiment of the micromechanical dispensing device 600, the micromechanical dispensing mechanism 610 comprises an electrostatically-driven membrane, which electrostatically-driven membrane is depicted in FIG. 6 by reference number 610a and which is substantially similar, or identical to the electrostatically-driven membrane described in the foregoing Kubby patent as described in connection with FIG. 2 hereinabove.

In another embodiment of the micromechanical dispensing device 600 the micromechanical dispensing mechanism 610 comprises an electrostatically-actuated piston, which electrostatically-actuated piston is depicted in FIG. 6 by reference number 610b and which is substantially similar, or identical to the electrostatically-actuated piston described in the foregoing Gooray '915 patent as described in connection with FIG. 2 hereinabove.

In a further embodiment of the micromechanical dispensing device 600 the micromechanical dispensing mechanism 610 comprises a magnetically-actuated membrane, which magnetically-actuated membrane is depicted in FIG. 6 by reference number 610c and which is substantially similar, or identical to the magnetically-actuated membrane described in the foregoing Genovese patent as described in connection with FIG. 2 hereinabove.

In a further embodiment of the micromechanical dispensing device 600 the micromechanical dispensing mechanism 610 comprises a thermally-actuated paddle vane, which thermally-actuated paddle vane is depicted in FIG. 6 by reference number 610e and which is substantially similar, or identical to the thermally-actuated paddle-vane described in the foregoing Silverbrook patent as described in connection with FIG. 2 hereinabove.

In yet a further embodiment of the micromechanical dispensing device 600 the micromechanical dispensing mechanism 610 comprises a ballistic aerosol dispensing mechanism, which ballistic aerosol dispensing mechanism is depicted in FIG. 6 by reference number 610d and which is substantially similar, or identical to the

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ballistic aerosol dispensing mechanism described in the foregoing Peeters '718 patent as described in connection with FIG. 2 hereinabove. -- .

L. At page 25, lines 4-6 delete the pending text and replace therewith as follows:

-- Additionally depicted in FIG. 6 is an optional orifice plate 695, further comprising an orifice 696. The optional orifice plate 695 is arranged such that fluid 671, 672, 673 dispensed by the micromechanical dispensing mechanism 610 is further dispensed through the orifice 696 , which dispensing of the fluid 671, 672, 673 through the orifice 696 is depicted in FIG. 6 by reference numbers 671a, 672a, 673a . -- .

M. At page 25, lines 15-19 delete the pending text and replace therewith as follows:

-- The micromechanical dispensing mechanisms 710, 711, 712 possess inlets 713, 714, 715 for receiving fluids to be dispensed. The inlets 713, 714, 715 are fluidly connected to the channel 754 that conducts fluid from the fluid reservoir 720 to the micromechanical dispensing mechanisms 710, 711, 712. The fluid reservoir 720 is removably fluidly coupled to channel port 726 by means of the reservoir port 723 of the fluid reservoir 720. -- .

N. At page 26, lines 11-30 delete the pending text and replace therewith as follows:

-- In one embodiment of the micromechanical dispensing device 700, one or more of the micromechanical dispensing mechanisms 710, 711, 712 comprises an electrostatically-driven membrane , which electrostatically-driven membrane is depicted in FIG. 7 by reference number 710a, 711a and which is substantially similar, or identical to the electrostatically-driven membrane described in the foregoing Kubby patent as described in connection with FIG. 2 hereinabove.

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In another embodiment of the micromechanical dispensing device 700, one or more of the micromechanical dispensing mechanisms 710, 711, 712 comprises an electrostatically-actuated piston, which electrostatically-actuated piston is depicted in FIG. 7 by reference number 710b, 711b and which is substantially similar, or identical to the electrostatically-actuated piston described in the foregoing Gooray '915 patent as described in connection with FIG. 2 hereinabove.

In a further embodiment of the micromechanical dispensing device 700, one or more of the micromechanical dispensing mechanism 710, 711, 712 comprises a magnetically-actuated membrane, which magnetically-actuated membrane is depicted in FIG. 7 by reference number 710c, 711c and which is substantially similar, or identical to the magnetically-actuated membrane described in the foregoing Genovese patent as described in connection with FIG. 2 hereinabove.

In a further embodiment of the micromechanical dispensing device 700, one or more of the micromechanical dispensing mechanisms 710, 711, 712 comprises a thermally-actuated paddle vane, which thermally-actuated paddle vane is depicted in FIG. 7 by reference number 710e, 711e and which is substantially similar, or identical to the thermally-actuated paddle-vane described in the foregoing Silverbrook patent as described in connection with FIG. 2 hereinabove.

In yet a further embodiment of the micromechanical dispensing device 700, one or more of the micromechanical dispensing mechanisms 710, 711, 712 comprises a ballistic aerosol dispensing mechanism, which ballistic aerosol dispensing mechanism is depicted in FIG. 7 by reference number 710d, 711d and which is substantially similar, or identical to the ballistic aerosol dispensing mechanism described in the foregoing Peeters '718 patent as described in connection with FIG. 2 hereinabove. -- .

O. At page 28, lines 13-16 delete the pending text and replace therewith as follows:

-- Additionally depicted in FIG. 7 is an optional orifice plate 795, further comprising an orifice 796. The optional orifice plate 795 is arranged such that fluid 771



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dispensed by one or more of the micromechanical dispensing mechanisms 710, 711, 712 is further dispensed through the orifice 796 , which dispensing of the fluid 771 through the orifice 796 is depicted in FIG. 7 by reference number 771a. -- .

P. From page 28, line 21 to page 33, line 24 delete the pending text and replace therewith as follows:

-- TABLE

| Number:     | Description:   |
|-------------|--|
| 100         | dispenser  |
| 200         | a micromechanical device to dispense one or more fluids into an atmosphere |
| 210         | micromechanical dispensing mechanism                                       |
| <u>210a</u> | <u>electrostatically-driven membrane</u>                                   |
| <u>210b</u> | <u>electrostatically-actuated piston</u>                                   |
| <u>210c</u> | <u>magnetically-actuated membrane</u>                                      |
| <u>210d</u> | <u>ballistic aerosol dispensing mechanism</u>                              |
| <u>210e</u> | <u>thermally-actuated paddle vane</u>                                      |
| 212         | micromechanical dispensing mechanisms                                      |
| 213         | inlet  |
| 214         | inlets   |
| 220         | fluid reservoir  |
| 222         | fluid reservoirs   |
| 223         | <u>reservoir</u> port  |
| 225         | <u>reservoir</u> ports   |
| 226         | <u>channel</u> port  |
| 228         | <u>channel</u> ports   |
| 231         | communication path   |
| 232         | communication path   |
| 233         | communication path   |

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|                    |  |
|--------------------|--|
| 234                | control interface  |
| 235                | sensor signal  |
| 240                | micromechanical dispensing device controller                     |
| 251                | check valve  |
| 253                | check valves   |
| 254                | channel  |
| 255                | channels   |
| 260                | sensor   |
| 261                | communication path   |
| 262                | sensor communication interface                                   |
| 263                | sensor signal  |
| 271                | fluid  |
| <b><u>271a</u></b> | <b><u>fluid 271 being dispensed through the orifice 296</u></b>  |
| 273                | fluids   |
| <b><u>273a</u></b> | <b><u>fluids 273 being dispensed through the orifice 296</u></b> |
| 280                | atmospheric substance  |
| 290                | dispersion pad   |
| 291                | gap  |
| 291'               | gap  |
| 295                | orifice plate  |
| 296                | orifice  |
| 300                | system for dispensing fluids                                     |
| 310                | system controller  |
| 313                | communication interface  |
| 330                | system sensor  |
| 340                | communication means  |
| 341                | communication path   |
| 342                | communication path   |
| 343                | communication path   |
| 344                | communication path   |

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345 system sensor signal  
350 atmospheric substance  
360 fluid  
400 a micromechanical device to dispense a plurality of fluids  
into an atmosphere  
410 micromechanical dispensing device  
410a electrostatically-driven membrane  
410b electrostatically-actuated piston  
410c magnetically-actuated membrane  
410d ballistic aerosol dispensing mechanism  
410e thermally-actuated paddle vane  
411 micromechanical dispensing device  
411a electrostatically-driven membrane  
411b electrostatically-actuated piston  
411c magnetically-actuated membrane  
411d ballistic aerosol dispensing mechanism  
411e thermally-actuated paddle vane  
412 micromechanical dispensing devices  
413 inlet  
414 inlet  
415 inlets  
420 fluid reservoir  
421 fluid reservoir  
422 fluid reservoirs  
423 reservoir port  
424 reservoir port  
425 reservoir ports  
426 channel port  
427 channel port  
428 channel ports

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|                    |  |
|--------------------|--|
| 431                | communication path   |
| 432                | communication path   |
| 433                | communication path   |
| 434                | control interface  |
| 435                | sensor signal  |
| 440                | micromechanical dispensing device controller                     |
| 451                | check valve  |
| 452                | check valve  |
| 453                | check valves   |
| 454                | channel  |
| 455                | channel  |
| 456                | channels   |
| 460                | sensor   |
| 461                | communication path   |
| 462                | sensor communication interface                                   |
| 463                | sensor signal  |
| 471                | fluid  |
| <b><u>471a</u></b> | <b><u>fluid 471 being dispensed through the orifice 496</u></b>  |
| 472                | fluid  |
| <b><u>472a</u></b> | <b><u>fluid 472 being dispensed through the orifice 496</u></b>  |
| 473                | fluids   |
| <b><u>473a</u></b> | <b><u>fluids 473 being dispensed through the orifice 496</u></b> |
| 480                | atmospheric substance  |
| 490                | dispersion pad   |
| 491                | gap  |
| 491'               | gap  |
| 495                | orifice plate  |
| 496                | orifice  |
| 500                | system for dispensing fluids                                     |
| 510                | system controller  |

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513 communication interface  
530 system sensor  
540 communication means  
541 communication path  
542 communication path  
543 communication path  
544 communication path  
545 system sensor signal  
550 atmospheric substance  
560 fluid  
600 a micromechanical device to dispense one or more fluids  
into an atmosphere  
610 micromechanical dispensing mechanism  
610a electrostatically-driven membrane  
610b electrostatically-actuated piston  
610c magnetically-actuated membrane  
610d ballistic aerosol dispensing mechanism  
610e thermally-actuated paddle vane  
611 channel  
611' channel  
612 channel  
613 inlet  
620 fluid reservoir  
621 fluid reservoirs  
622 fluid reservoir  
623 reservoir port  
624 reservoir ports  
625 reservoir port  
626 channel port  
627 channel ports

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|                    |  |
|--------------------|--|
| 628                | <u>channel</u> port  |
| 631                | communication path   |
| 632                | communication path   |
| 633                | communication path   |
| 634                | dispenser control interface                                      |
| 635                | sensor signal  |
| 637                | communication path   |
| 640                | micromechanical dispensing device controller                     |
| 651                | check valve  |
| 652                | check valves   |
| 653                | check valve  |
| 660                | sensor   |
| 661                | communication path   |
| 662                | sensor communication interface                                   |
| 663                | sensor signal  |
| 665                | valve  |
| 670                | mixing chamber   |
| 671                | fluid  |
| <b><u>671a</u></b> | <b><u>fluid 671 being dispensed through the orifice 696</u></b>  |
| 672                | fluids   |
| <b><u>672a</u></b> | <b><u>fluids 672 being dispensed through the orifice 696</u></b> |
| 673                | fluid  |
| <b><u>673a</u></b> | <b><u>fluid 673 being dispensed through the orifice 696</u></b>  |
| 680                | atmospheric substance  |
| 690                | dispersion pad   |
| 691                | gap  |
| 691'               | gap  |
| 695                | orifice plate  |
| 696                | orifice  |
| 700                | a micromechanical device to dispense a fluid into an             |

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|             |   |
|-------------|---|
|             | atmosphere                                    |
| 710         | micromechanical dispensing mechanism          |
| <u>710a</u> | <u>electrostatically-driven membrane</u>      |
| <u>710b</u> | <u>electrostatically-actuated piston</u>      |
| <u>710c</u> | <u>magnetically-actuated membrane</u>         |
| <u>710d</u> | <u>ballistic aerosol dispensing mechanism</u> |
| <u>710e</u> | <u>thermally-actuated paddle vane</u>         |
| 711         | micromechanical dispensing mechanism          |
| <u>711a</u> | <u>electrostatically-driven membrane</u>      |
| <u>711b</u> | <u>electrostatically-actuated piston</u>      |
| <u>711c</u> | <u>magnetically-actuated membrane</u>         |
| <u>711d</u> | <u>ballistic aerosol dispensing mechanism</u> |
| <u>711e</u> | <u>thermally-actuated paddle vane</u>         |
| 712         | micromechanical dispensing mechanisms         |
| 713         | inlet   |
| 714         | inlet   |
| 715         | inlets  |
| 720         | fluid reservoir                               |
| 723         | <u>reservoir</u> port                         |
| 726         | <u>channel</u> port                           |
| 731         | communication path                            |
| 732         | communication path                            |
| 733         | communication path                            |
| 734         | dispenser control interface                   |
| 735         | sensor signal                                 |
| 740         | micromechanical dispensing device controller  |
| 751         | check valve                                   |
| 754         | channel                                       |
| 760         | sensor  |
| 761         | communication path                            |

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|             |   |
|-------------|---|
| 762         | sensor communication interface                                  |
| 763         | sensor signal   |
| 771         | fluid   |
| <b>771a</b> | <b><u>fluid 771 being dispensed through the orifice 796</u></b> |
| 780         | atmospheric substance   |
| 790         | dispersion pad  |
| 791         | gap   |
| 791'        | gap   |
| 795         | orifice plate   |
| 796         | orifice -- ,  |

Q. From page 33, line 25 to page 40, line 34 delete the pending text and replace therewith as follows:

-- Thus, there has been described the first aspect of the invention , **generally as depicted in FIG. 2**, namely, a micromechanical dispensing device **(200)** to dispense one or more fluids **(271, 273)** into an atmosphere **[[ (200) ]]** , the micromechanical dispensing device (200) comprising one or more micromechanical dispensing mechanisms (210, 212), each micromechanical dispensing mechanism of the one or more micromechanical dispensing mechanisms (210, 212) fluidly connected to a corresponding fluid reservoir (220, 222); the micromechanical dispensing device (200) further comprising a micromechanical dispensing device controller (240), the micromechanical dispensing device controller (240) arranged to communicate with each micromechanical dispensing mechanism of the one or more micromechanical dispensing mechanisms (210, 212).

In one embodiment, the micromechanical dispensing device **(200)** to dispense one or more fluids **(271, 273)** into an atmosphere **[[ (200) ]]** further comprises at least one port (226, 228) to which the corresponding fluid reservoir (220, 222) may be removably, fluidly connected.



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In another embodiment, in the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere [(200)], at least one micromechanical dispensing mechanism of the one or more micromechanical dispensing mechanisms (210, 212) further comprises an electrostatically-driven membrane (210a), an electrostatically-actuated piston (210b), a magnetically-actuated membrane (210c), a thermally-actuated paddle vane (210e) or a ballistic aerosol dispensing mechanism (210d).

In one embodiment, in the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere [(200)], at least one fluid reservoir (220, 222) contains a fluid (271, 273), the fluid comprising a perfume, pheromone, moisturizer, humectant, miticide, deodorizer, disinfectant, sanitizing agent or insecticide.

In another embodiment, the micromechanical dispensing device to dispense one or more fluids (271, 273) into an atmosphere [(200)] further comprises a sensor (260), the sensor (260) arranged to form a sensor signal (235) responsive to an atmospheric substance (280), and to communicate the sensor signal (235) to the micromechanical dispensing device controller (240).

In a further embodiment, in the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere 200, the atmospheric substance (280) is a fluid (271, 273) that has been dispensed by the micromechanical dispensing device (200) to dispense one or more fluids into an atmosphere [(200)].

In one embodiment, in the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere (200), the micromechanical dispensing device controller (240) is arranged to actuate at least one of the one or more micromechanical dispensing mechanisms (210, 212) in response to the sensor signal (235).

In another embodiment, the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere [(200)] further comprises one or more check valves (251, 253), wherein each of the one or more check valves (251, 253) is interposed between a corresponding micromechanical

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dispensing mechanism (210, 212) from amongst the one or more micromechanical dispensing mechanisms (210, 212) and the corresponding fluid reservoir (220, 222) of the corresponding micromechanical dispensing mechanism (210, 212).

In one embodiment, the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere [(200)] further comprises a dispersion pad (290), wherein the dispersion pad (290) is arranged to receive at least one fluid (271, 273) dispensed into the atmosphere by at least one of the one or more micromechanical dispensing mechanisms (210, 212), wherein the dispersion pad (290) comprises porous ceramics, celluloseic fibers, flax, cotton, wood, protein-based fibers, wool, animal hides, nylon, polyester or olefinic fibers.

In another embodiment, the micromechanical dispensing device (200) to dispense one or more fluids (271, 273) into an atmosphere [(200)] further comprises an orifice plate (295), the orifice plate (295) comprising an orifice (296), the orifice plate (295) arranged such that at least one fluid of the one or more fluids (271, 273) dispensed by at least one of the one or more micromechanical dispensing mechanisms (210, 212) is further dispensed (271a, 273a) through the orifice (296).

Thus, there has been described the second aspect of the invention, generally as depicted in FIG. 3, namely, a system (300) to dispense a plurality of fluids into an atmosphere [(300)], the system (300) comprising a micromechanical dispensing device (200), the micromechanical dispensing device (200) comprising one or more micromechanical dispensing mechanisms (210, 212), each micromechanical dispensing mechanism of the one or more micromechanical dispensing mechanisms (210, 212) fluidly connected to a corresponding fluid reservoir (220, 222); the micromechanical dispensing device (200) further comprising a micromechanical dispensing device controller (240), the micromechanical dispensing device controller (240) arranged to communicate with each micromechanical dispensing mechanism of the one or more micromechanical dispensing mechanisms (210, 212); the system further comprising at least one other dispensing device (100, 200, 400, 600, 700), and a system controller (310), the system controller (310) arranged to communicate with the micromechanical

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dispensing device (200) and with each of the at least one other dispensing devices (100, 200, 400, 600, 700).

In one embodiment, in the system (300) to dispense a plurality of fluids into an atmosphere [[ (300) ]], at least one of the one or more micromechanical dispensing mechanisms (210, 212) of the micromechanical dispensing device (200), further comprises an electrostatically-driven membrane (210a), an electrostatically-actuated piston (210b), a magnetically-actuated membrane (210c), a thermally-actuated paddle vane (210e) or a ballistic aerosol dispensing mechanism (210d).

In another embodiment, in the system (300) to dispense a plurality of fluids into an atmosphere [[ (300) ]], at least one fluid reservoir (220, [[ 221 ]] 222 ) contains a fluid (271, 273), the fluid comprising a perfume, a pheromone, moisturizer, humectant, miticide, deodorizer, disinfectant, sanitizing agent or insecticide.

In one embodiment, the system (300) to dispense a plurality of fluids into an atmosphere [[ (300) ]] is arranged to dispense at least one of the plurality of fluids (271, 273) by the micromechanical dispensing device (200) and to dispense at least one other of the plurality of fluids (360) by the at least one other dispensing device (100, 200, 400, 600, 700).

In another embodiment, the system (300) to dispense a plurality of fluids into an atmosphere [[ (300) ]] further comprises a system sensor (330), the system sensor (330) arranged to form a system sensor signal (345) responsive to an atmospheric substance (350) and to communicate the system sensor signal (345) to the system controller (310).

In a further embodiment, in the system (300) to dispense a plurality of fluids into an atmosphere [[ (300) ]], the system controller is arranged to actuate at least one of the micromechanical dispensing device (200) and the at least one other dispensing device (100, 200, 400, 600, 700, 800) in response to the system sensor signal (345).

In one embodiment, in the system (300) to dispense a plurality of fluids into an atmosphere [[ (300) ]], the micromechanical dispensing device (200) further comprises a sensor (260), the sensor (260) arranged to form a sensor signal (263) responsive to

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the atmospheric substance (350) and to communicate the sensor signal (263) to the system controller (310).

In a further embodiment, in the system (300) to dispense a plurality of fluids into an atmosphere [(300)], the system controller (310) is arranged to actuate at least one of the micromechanical dispensing device (200) and the at least one other dispensing device (100, 200, 400, 600, 700, 800) in response to the sensor signal (263).

In one embodiment, the system (300) to dispense a plurality of fluids into an atmosphere [(300)], further comprises a communication means (340), the communication means comprising a network (340).

In another embodiment, in the system (300) to dispense a plurality of fluids into an atmosphere [(300)], the network (340) comprises a wireless network (340).

Thus, there has been described the third aspect of the invention, generally as depicted in FIG. 4, namely, a micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], the micromechanical dispensing device (400) comprising a plurality of micromechanical dispensing mechanisms (410, 411, 412), each micromechanical dispensing mechanism of the plurality of micromechanical dispensing mechanisms (410, 411, 412) fluidly connected to a corresponding fluid reservoir (420, 421, 422); the micromechanical dispensing device (400) further comprising a micromechanical dispensing device controller (440), the micromechanical dispensing device controller (440) arranged to communicate with each micromechanical dispensing mechanism of the plurality of micromechanical dispensing mechanisms (410, 411, 412).

In one embodiment, the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)] further comprises at least one port (426, 427, 428) to which the corresponding fluid reservoir (420, 421, 422) may be removably, fluidly connected.

In one embodiment, in the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], at least one micromechanical dispensing mechanism of the plurality of micromechanical

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dispensing mechanisms (410, 411, 412) further comprises an electrostatically-driven membrane (410a, 411a), an electrostatically-actuated piston (410b, 411b), a magnetically-actuated membrane (410c, 411c), a thermally-actuated paddle vane (410e, 411e) or a ballistic aerosol dispensing mechanism (410d, 411d).

In another embodiment, the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)] further comprises a fluid (471, 472, 473), the fluid comprising a perfume, pheromone, moisturizer, humectant, miticide, deodorizer, disinfectant, sanitizing agent or insecticide.

In one embodiment, the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], further comprises a sensor (460), the sensor (460) arranged to form a sensor signal (435) responsive to an atmospheric substance (480) and to communicate the sensor signal (435) to the micromechanical dispensing device controller (440).

In one embodiment, in the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], the atmospheric substance (480) to which the sensor signal (435) is responsive is a fluid (471, 472, 473) that has been dispensed by the micromechanical dispensing device (400) to dispense a plurality of fluids into an atmosphere [(400)].

In one embodiment, in the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], the micromechanical dispensing device controller (440) is arranged to actuate at least one of the plurality of micromechanical dispensing mechanisms (410, 411, 412) in response to the sensor signal (435).

In another embodiment, the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], further comprises at least one check valve (451, 452, 453) interposed between at least one of the plurality of micromechanical dispensing mechanisms (410, 411, 412) and its corresponding fluid reservoir (420, 421, 422).

In one embodiment, the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [(400)], further comprises a

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dispersion pad (490), wherein the dispersion pad (490) is arranged to receive at least one fluid (471, 472, 473) dispensed into the atmosphere by at least one of the plurality of micromechanical dispensing mechanisms (410, 411, 412), wherein the dispersion pad (490) comprises porous ceramics, celluloseic fibers, flax, cotton, wood, protein-based fibers, wool, animal hides, nylon, polyester or olefinic fibers.

In one embodiment, the micromechanical dispensing device (400) to dispense a plurality of fluids (471, 472, 473) into an atmosphere [[ (400) ]], further comprises an orifice plate (495), the orifice plate (495) comprising an orifice (496), the orifice plate (495) arranged such that at least one fluid of the plurality of fluids (471, 472, 473) dispensed by at least one of the plurality of micromechanical dispensing mechanisms (410, 411, 412) is further dispensed (471a, 472a, 473a) through the orifice (496).

Thus, there has been described the fourth aspect of the invention, generally as depicted in FIG. 5, namely, a system (500) to dispense a plurality of fluids into an atmosphere [[ (500) ]], the system (500) comprising a micromechanical dispensing device (400), the micromechanical dispensing device (400) comprising a plurality of micromechanical dispensing mechanisms (410, 411, 412), each micromechanical dispensing mechanism of the plurality of micromechanical dispensing mechanisms (410, 411, 412) fluidly connected to a corresponding fluid reservoir (420, 421, 422); the micromechanical dispensing device (400) further comprising a micromechanical dispensing device controller (440), the micromechanical dispensing device controller (440) arranged to communicate with each micromechanical dispensing mechanism of the plurality of micromechanical dispensing mechanisms (410, 411, 412); and the system further comprising a system controller (510), the system controller (510) arranged to communicate with the micromechanical dispensing device (400).

In one embodiment, in the system (500) to dispense a plurality of fluids into an atmosphere [[ (500) ]], at least one of the plurality of micromechanical dispensing mechanisms (410, 411, 412) of the micromechanical dispensing device (400), further comprises an electrostatically-driven membrane (410a, 411a), an electrostatically-actuated piston (410b, 411b), a magnetically-actuated membrane (410c, 411c), a

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thermally-actuated paddle vane (410e, 411e) or a ballistic aerosol dispensing mechanism (410d, 411d).

In one embodiment, in the system (500) to dispense a plurality of fluids into an atmosphere [(500)], at least one fluid reservoir (420, 421, 422) of the micromechanical dispensing device (400) contains a fluid (471, 472, 473), the fluid comprising a perfume, pheromone, moisturizer, humectant, miticide, deodorizer, disinfectant, sanitizing agent or insecticide.

In one embodiment, the system (500) to dispense a plurality of fluids into an atmosphere [(500)], further comprises a second dispenser to dispense one or more fluids into an atmosphere (100, 200, 400, 600, 700), the second dispenser (100, 200, 400, 600, 700), arranged to communicate with the system controller 510, wherein at least one fluid reservoir (420, 421, 422) of the micromechanical dispensing device (400) contains a first fluid (471, 472, 473) and the second dispenser (100, 200, 400, 600, 700) contains a second fluid (560) which is different from the first fluid (471, 472, 473).

In one embodiment, the system (500) to dispense a plurality of fluids into an atmosphere [(500)] further comprises a system sensor (530), the system sensor (530) arranged to form a system sensor signal (545) responsive to an atmospheric substance (550) and to communicate the system sensor signal (545) to the system controller (510).

In a further embodiment, in the system (500) to dispense a plurality of fluids into an atmosphere [(500)], the system controller (510) is arranged to actuate the micromechanical dispensing device (400) in response to the system sensor signal (545).

In one embodiment, in the system (500) to dispense a plurality of fluids into an atmosphere [(500)], the micromechanical dispensing device (400) further comprises a sensor (460), the sensor (460) arranged to form a sensor signal (463) responsive to an atmospheric substance (480) and to communicate the sensor signal (463) to the system controller (510).

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In a further embodiment, in the system (500) to dispense a plurality of fluids into an atmosphere [(500)] the system controller (510) is arranged to actuate the micromechanical dispensing device (400) in response to the sensor signal (463).

In one embodiment, the system (500) to dispense a plurality of fluids into an atmosphere [(500)] further comprises a communication means (540), the communication means comprising a wireless network (540).

Thus, there has been described the fifth aspect of the invention, generally as depicted in FIG. 6, namely, a micromechanical dispensing device (600) to dispense one or more fluids (671, 672, 673) into an atmosphere [(600)], the micromechanical dispensing device (600) comprising a micromechanical dispensing mechanism (610), the micromechanical dispensing mechanism (610) fluidly connected to a plurality of fluid reservoirs (620, 621, 622); and further comprising a valve (665), the valve arranged to selectively couple each fluid reservoir of the plurality of fluid reservoirs (620, 621, 622) to the micromechanical dispensing mechanism (610); and, the micromechanical dispensing device (600) further comprising a micromechanical dispensing device controller (640), the micromechanical dispensing device controller (640) arranged to communicate with the micromechanical dispensing mechanism (610) and the valve (665).

In one embodiment, in the micromechanical dispensing device (600) to dispense one or more fluids (671, 672, 673) into an atmosphere [(600)], the micromechanical dispensing mechanism (610) further comprises an electrostatically-driven membrane (610a), an electrostatically-actuated piston (610b), a magnetically-actuated membrane (610c), a thermally-actuated paddle vane (610e) or a ballistic aerosol dispensing mechanism (610d).

In one embodiment, in the micromechanical dispensing device (600) to dispense one or more fluids (671, 672, 673) into an atmosphere [(600)], at least one fluid reservoir (620, 621, 622) contains a fluid (671, 672, 673), the fluid comprising a perfume, pheromone, moisturizer, humectant, miticide, deodorizer, disinfectant, sanitizing agent or insecticide.



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In one embodiment, the micromechanical dispensing device (600) to dispense one or more fluids (671, 672, 673) into an atmosphere [(600)], further comprises a sensor (660), the sensor (660) arranged to form a sensor signal (636) responsive to an atmospheric substance (680) and to communicate the sensor signal (636) to the micromechanical dispensing device controller (640), and the micromechanical dispensing device controller (640) is arranged to actuate the micromechanical dispensing mechanism (610) in response to the sensor signal (636).

In one embodiment, the micromechanical dispensing device (600) to dispense one or more fluids (671, 672, 673) into an atmosphere [(600)], further comprises a mixing chamber (670), the mixing chamber (670) fluidly interposed between the micromechanical dispensing mechanism (610) and the plurality of fluid reservoirs (620, 621, 622).

Thus, there has been described the sixth aspect of the invention, generally as depicted in FIG. 7, namely, a micromechanical dispensing device (700) to dispense a fluid (771) into an atmosphere [(700)] the micromechanical dispensing device (700) comprising a plurality of micromechanical dispensing mechanisms (710, 711, 712), the plurality of micromechanical dispensing mechanisms (710, 711, 712) fluidly connected to a fluid reservoir (720); and, the micromechanical dispensing device (700) further comprising a micromechanical dispensing device controller (740), the micromechanical dispensing device controller (740) arranged to communicate with the plurality of micromechanical dispensing mechanisms (710, 711, 712).

In one embodiment, the micromechanical dispensing device (700) to dispense a fluid (771) into an atmosphere [(700)], further comprises a port (726) to which the fluid reservoir (720) may be removably, fluidly connected.

In one embodiment, in the micromechanical dispensing device (700) to dispense a fluid (771) into an atmosphere [(700)], at least one micromechanical dispensing mechanism (710, 711, 712) further comprises an electrostatically-driven membrane (710a, 711a), an electrostatically-actuated piston (710b, 711b), a magnetically-actuated membrane (710c, 711c), a thermally-actuated paddle vane (710e, 711e) or a ballistic aerosol dispensing mechanism (710d, 711d).

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In one embodiment, the micromechanical dispensing device (700) to dispense a fluid (771) into an atmosphere [(700)] further comprises a fluid (771), the fluid comprising a perfume, pheromone, moisturizer, humectant, miticide, deodorizer, disinfectant, sanitizing agent or insecticide.

In one embodiment, the micromechanical dispensing device (700) to dispense a fluid (771) into an atmosphere [(700)] further comprises a sensor (760), the sensor (760) arranged to form a sensor signal (735) responsive to an atmospheric substance (780) and to communicate the sensor signal (735) to the micromechanical dispensing device controller (740), and the micromechanical dispensing device controller (740), is arranged to actuate the plurality of micromechanical dispensing mechanisms (710, 711, 712) in response to the sensor signal (735). -- .